Statistics.
Exercises - 2. lecture

Exercise 7

Suppose that T has a t-distibution with 2 degrees of freedom.

What is the probability that T exceeds 2? Exceeds 3?

What would be the answers if instead T had a standard normal distribution?

Exercise 13

An adjustment yields a posterior standard deviation of $s = 2.7$.

Determine a 95% confidence interval for the true standard deviation in case the adjustment has

(a) 10 redundants.

(b) 20 redundants.

(c) 100 redundants.

Exercise 14

The height difference between two points has been measured 9 times with results in mm:

$$110, 109, 110, 108, 111, 112, 109, 111, 112$$

(a) Assume that the variance is known and equal to the prior variance $\sigma_0^2 = 1$.

Determine a 95% confidence interval for the height difference.

(b) Assume that the variance is unknown and estimated by the posterior variance.

Determine a 95% confidence interval for the height difference.

(c) Determine a 95% confidence interval for the unknown standard deviation.

Exercise 15

Yoy have done 15 readings of a height difference. The readings are supposed to be a sample from a normal population, and the observations are in mm:

1412.80	1412.85	1412.87	1413.09	1412.50
1412.80	1412.86	1412.84	1412.66	1412.80
1412.84	1412.84	1412.78	1413.02	1412.72

(a) Determine 95% and 99% confidence intervals for the exact reading.

(b) Determine 50% and 95% confidence intervals for the standard deviation of the measurement error.

Investigate the following hypotheses:

(c) $H_0 : \mu = 1413mm$ againts $H_A : \mu \neq 1413mm$.

(d) $H_0 : \mu = 1412.75mm$ againts $H_A : \mu \neq 1412.75mm$.

(e) $H_0 : \sigma = 0.08mm$ againts $H_A : \sigma \neq 0.08mm$.

Actually, the manufacturer of the measuring device claims that the standard deviation of the measurement error is at most $0.11mm$. So investigate the following hypotheses:

(f) $H_0 : \sigma = 0.11mm$ againts $H_A : \sigma > 0.11mm$.

(g) $H_0 : \mu = 1412.75mm$ againts $H_A : \mu \neq 1412.75mm$, when $\sigma = 0.11mm$